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POSSIBLE DISRUPTION OF REMOTE VIEWING BY COMPLEX WEAK MAGNETIC FIELDS AROUND THE STIMULUS SITE AND THE POSSIBILITY OF ACCESSING REAL PHASE SPACE: A PILOT STUDY[1]

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Summary.—In 2002 Persinger, Roll, Tiller, Koren, and Cook considered whether there are physical processes by which recondite information exists within the space and time of objects or events. The stimuli that compose this information might be directly detected within the whole brain without being processed by the typical sensory modalities. We tested the artist Ingo Swann who can reliably draw and describe randomly selected photographs sealed in envelopes in another room. In the present experiment the photographs were immersed continuously in repeated presentations (5 times per sec.) of one of two types of computer-generated complex magnetic field patterns whose intensities were less than 20 nT over most of the area. WINDOWS-generated but not DOS-generated patterns were associated with a marked decrease in Mr. Swann's accuracy. Whereas the DOS software generated exactly the same pattern, WINDOWS software phase-modulated the actual wave form resulting in an infinite bandwidth and complexity. We suggest that information obtained by processes attributed to "paranormal" phenomena have physical correlates that can be masked by weak, infinitely variable magnetic fields.

The phenomena of consciousness and awareness are generated by the human brain. Of the likely infinite number of bits of information available within the physical environment, only a minute fraction are transduced by sensory neurons and distributed as transformed digital patterns into the cerebral cortices (Norrentranders, 1998). We have been investigating individuals who appear to access consistently information about objects and people at a distance by mechanisms not known to date. Although these phenomena have been considered "spiritual" or "paranormal," these attributions are not necessarily accurate. During the display of paranormal phenomena the brains of these individuals exhibit either unusual electrical or metabolic activity within the right parietooccipital regions (Roll, Persinger, Webster, Tiller, & Cook, 2002). Consequently, there is the possibility that these people may be aware of stimuli in some manner that is not yet described by scientists.

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Ingo Swann (Persinger, Roll, Tiller, Koren, & Cook, 2002) had consistently identified objects at a distance for several decades. He trained others to engage in this process, called "remote viewing," which is remarkably similar to the techniques employed by the introspectionists during the late nineteenth century. During his experiences as a "remote viewer," Mr. Swann had noted that structures located within geomagnetically complex areas, such as the rails converging and intersecting around train stations, were not discerned accurately. We reasoned that accurate detection may have been masked by complex geomagnetic fields within which the structures were immersed. The failure to discern the stimulus would be analogous to not hearing a whisper if a jack hammer was in operation.

During Mr. Swann's visit to our laboratory during July, 2000, we designed an experiment to manipulate the electromagnetic field around hidden photographs while he was attempting to perceive the details of these stimuli by "remote viewing." The essential procedure was to place a randomly selected photograph of some emotionally relevant context, such as an inspiring view from a mountain top or the fragments of a crashed passenger airplane, within an envelope in a specific place Mr. Swann had seen. While sitting in another room and being observed by the experimenters he would cognitively "focus" on this area and then report his experiences verbally and draw what he thought the stimulus might be. The only unusual aspect of this simple example of a stimulus-response relationship, which is the functional unit of psychology, was the apparent absence of connectivity between the two.

We assumed Mr. Swann accessed the details about objects and events at distance by detecting information, perhaps stored as digital patterns, within the complex very low intensity magnetic fields that occupy the space we normally perceive as mass or that reflect the changes in the position of mass in space we normally perceive as temporal order. Very complex, very low intensity, time-varying magnetic fields would have astronomical degrees of freedom and hence the capacity to represent information well above the range of Mbytes.

Our idea was modeled from the research of Garcia-Ojalvo and Roy (2001) who proposed a system that allowed communication of spatiotemporal information by using an optical chaotic carrier waveform. We also suspected, as did Michael Faraday over a century ago (Frank, 1991), the recondite potential within the intrinsic capacitance (measured in farads) and inductance (measured in Henrys) of free space. Faraday suggested they represented factors now called temporal variations (or waves) in gravitational and electromagnetic fields, respectively. Interactions between these fundamental processes may serve as the substrate for the creation and representation of this information.

We reasoned that application of a specific, localized, repetitive field through the target being accessed by Mr. Swann might increase his detection of the information of the object. The complexity more than the intensity of the field was considered important. If one wished to attract the attention of another person at a distance, complex fluctuations in the levels of sound pressures of about 10 mPa in the kHz range would be more effective than changes of pressure a million times more intense (10 kPa) in the mHz range. The first condition would be typical of the sound-pressure levels of human speech while the second would characterize the sound-pressure levels of an approaching air mass.

We envisioned the process would be like the localization of a very minute stimulus (such as an airplane) within a very large area by using its transponder or beacon for focus and direction. Previously (Persinger, *et al.*, 2002) we found that Mr. Swann's accuracy for the "remote viewing" of hidden photographs or objects was correlated with the durations of 7-Hz spike-and-slow wave activity over his right occipital region. This electrophysiological state might be associated with a type of vigilance for information normally filtered or excluded by visual processing.

Method

In a single setting, Mr. Swann was asked to draw eight separate hidden stimuli on eight separate trials separated by about 5 min. The procedure has been described in detail elsewhere (Persinger, *et al.*, 2002). The stimuli were color pictures containing emotional themes extracted from old magazines. Each of the eight stimuli was sealed in a 30-cm by 22-cm brown paper envelope. The envelope was randomly selected by a person who had not been involved with the experiment.

The envelope containing the picture was the only object on a table in another room whose linear distance was about 8 m from where Mr. Swann sat within a closed acoustic chamber. The mean X, Y, and Z components of the geomagnetic (static) field within the space occupied by the envelope, as measured by a Meda FM 300 vector magnetometer, were 3.76 microT, 18.63 microT, and 49.10 microT, respectively. The inclination of the static field was 68.8° while the declination was −101.3°.

We selected two patterns, a sine wave of decreasing amplitude and a sequence based upon the Fibonacci series, to serve as "transponder" stimuli. The latter was selected because there are multiple examples of this relationship within the spatial organization of living systems (Ball, 1999). The files from which the patterns were generated contained a column of 200 numbers with each number ranging from 0 to 255. Values above 127 were positive polarity while values below 127 were negative polarity. The voltage equivalent for each number was activated for 1 msec.

The magnetic fields were created by converting the series of numbers to voltages through a custom-constructed, digital-to-analogue converter (DAC) that generated the magnetic fields through a small modified reed-switch relay that served as a solenoid. The digital-to-analogue program (Version 1.4 Copyright S. Koren, July 1998) was run on a PC computer Model FORCE-15 (80486 microprocessor with 12.0 Mbytes of RAM memory) manufactured by Packard Bell. The two types of programs were Microsoft MS-Windows 95 Version 4.00.950 B platform and MS-DOS MSW95 Version 4.00.1111.

The solenoid was placed on the top of the table such that the magnetic fields were applied across the minor axis of the envelope and were oriented in an E-SE direction. The field strength of the two patterns that were generated continuously by the computer during the specific trials was 5 microT (50 mG) at the surface of the solenoid according to a sensor (Metex N380 meter coupled to a magnetic sensor: Electric Field Measurements, Rt. 183 W. Stockbridge, MA 01266).

The edge of the solenoid was placed midpoint along the major axis of the envelope about 4 cm from the edge. At the proximal edge of the envelope and for each of the successive 2-cm distances along the envelope the measurements were 4 microT, 2 cm 180 nT, 4 cm 90 nT, 6 cm 60 nT, 8 cm 50 nT, 10 and 12 cm 30 nT, and 14, 16, 18, 20, 22, and 24 cm 20 nT. At distances more than 5 cm from this bisecting line the values were between 20 nT and 10 nT, the limits of the instrument.

We had found during the design of various waveforms that presentation of the numerical files (containing the numbers 0 to 255) through DOS programs or through Microsoft Windows generated different textures within the patterns from the same sequence of numbers. When transformed to audible files by software available on most contemporary personal computers, these differences were easily discernible, for example, we simply "listened" to the acoustic equivalents of the electrical patterns generated from the "brain stimulation device" employed by the *Aum Shinrikyo* cult in Japan. The device had been constructed for children to wear on their heads to "facilitate a spiritual connection between children within the cult and its leader." The acoustic equivalents of that pattern were easily identified as 35 Hz to 40 Hz electroencephalographic activity and a human heart beat (Koren & Persinger, 1997).

The files generated through the software WINDOWS contained multiple harmonics we attributed to the background operation of the software during the execution of the files containing the various patterns. These measurements were completed on a PC Computer IPC Model 486-II MT (80486 microprocessor with 8.9 Mbytes of RAM memory). The measurement software was MS Sound Recorder (Version 3.1 Copyright MS Corp. 1992) with a Sound Card (Creative Model SB-16). A standard telephone magnetic

pickup sensor coil (Radio Shack Model 44-533) was connected to the microphone input of the sound card. The sensor was placed in the vicinity (about 5 cm) from the solenoids. The resultant WAV files, sampled at 11.025 kHz, were analyzed employing Spectrum Analysis Software (Spectrogram Version 5.0.1 Copyright R. S. Horne, 1999). A second measurement session used the same design except the sampling was increased to 22.050 kHz to allow a higher resolution of the spectral image.

The statements and drawings for each of the eight photographs were ranked by two people from along a 0 to 10 range where 0 indicated no response or no obvious congruence while 10 indicated the drawing and comments reflected the basic structure and theme of the stimulus.

Results

The order, type of field generated across the stimuli, and the scores for Mr. Swann's drawing and comments are shown in Table 1. The two photographs exposed to the waveforms generated by WINDOWS software were associated with the poorest scoring. The photographs exposed to the same patterns, but generated by DOS software, were associated with the accurate descriptions and drawings that typify Mr. Swann's "remote viewing."

TABLE 1
Procedure and Score (Scale From 0 to 10) For Congruence Between Subject's Drawings or Comments and Actual Photograph

Condition	Score
1. No field	8
2. Equipment moved near table	9
3. Sinusoid Field through DOS	6
4. Sinusoid Field through Windows	0
5. Fibonacci Field through DOS	8
6. Fibonacci Field through Windows	1
7. Field off/equipment on	5
8. Equipment moved to side of room	7

Patterns of the spectral analyses from the magnetic fields generated by the solenoids were conspicuously different from the DOS and WINDOWS software even though the same number files were transformed. The modal frequencies for the sharp bands of the spectral analyses were 48 Hz, 877–974 Hz, 1803–1900 Hz, 2729–2826 Hz, 3752–3655 Hz, 4667–4570 Hz, and 5496–5596 Hz. The DOS generated patterns contained their energy within the lower three, very discrete bands. However, the WINDOWS generated patterns contained energies across the entire spectrum of potential frequencies. This could be seen as continuous vertical, diffuse whitish lines that crossed all frequency bands.

When the fields were generated, there was a more important observation which we had previously not detected in our comparisons of software. Whereas the generation of each signal shape was identical from the DOS files, the generation of each pattern by WINDOWS contained a *different* and what might be considered a unique, complex overlay even though the same file of numbers between 0 and 255 was being transformed. Magnification of the spectral signatures for each presentation of the same field by WINDOWS showed a different, extremely complex dispersion of frequencies with extremely intricate structures.

Discussion

We suggest that our normal perceptions only extract a small fraction of the information correlated with the existence of objects in space-time. This concept has been developed by Norrentranders (1991) and by the innovative integrations of Jahn and Dunne (1987). This information would be expressed as temporally and spatially complex microelectromagnetic fields rather than by the objects themselves. Stated alternatively, there would be a third factor from which both objects and this hypothesized information would be generated.

We had assumed this information might be detected more reliably in larger increments of space and time (Persinger, 1999) if there were intrinsic characteristics within these fields whose functions might be analogous to signal transponders designed to focus "attention." This information would be very complex and contained within very weak, highly localized electromagnetic patterns. We could not measure the strength of these microcomplex fields directly given the limitations of our equipment.

However, first-order approximations, accommodating the limitations of the impedance matching between the digital-to-analogue equipment and the solenoid, the computer port times, and the software for spectral analysis suggests intensities within the low picoTesla range. They would have been immersed within the carrier intensities that were in the order of nanoTesla applied across spatial gradients of primarily less than 20 nT/cm.

The results did not support our hypothesis that a complex magnetic field could act as a transponder or a "cue" for the perceptual processes associated with remote viewing. Instead, the results suggest weak, temporally *complex* magnetic fields generated within the space of the hidden photograph may have interfered with the stimuli required for Mr. Swann's perception of the information within that space. If this information requires an optimal increment of intensity to be discerned and complexity and masking of this information was actually accomplished in this experiment, then these results suggest that very dense, complex variations of weak magnetic fields within a small space may contain extraordinary amounts of information. At

present this holographic view of matter and the information that either forms it or with which it is correlated in time remain a speculation.

The textures of the geometric shapes of the signatures generated by WINDOWS were reminiscent of the elaborate filament structures of fractals and other elegant complex configurations generated by mathematical relationships such as $z=z^2+c$ (the Mandelbrot set), where z and c are complex numbers ($a+bi$ where $i=$imaginary number), and the value c is the complex point currently being tested for inclusion within a set. The process involves taking a complex number initialized to zero ($z=0+0i$), then multiplying it by itself, and then adding it to the original test point ($c=a+bi$). This sum is then assigned to z, and the above step is repeated in a loop with the new value of z until either the point is rejected from or accepted within the set. This criterion is accomplished after a preset number of loops is completed ($n=100$ or more depending upon the resolution required).

If the absolute value of either the real or the imaginary part has not exceeded a preset value (usually 2) after n loops, then it can be concluded that the point will not accelerate to infinity and thus it can be accepted as being in the Mandelbrot set. The value is plotted as such (usually a black dot). If, however, the point is rejected, the number of loops required to reject the point now defines a unique color to be plotted.

These appear in the Mandelbrot set in a manner similar to contour lines and connect the areas containing rejection sectors of similar points. The above test loop is repeated point by point to create a graphical image representing a two-dimensional sector of the Mandelbrot set on as many points as are needed to satisfy the required resolution. For example, if a square sector from $(-10, +10i)$ to $(+10, -10i)$ with a resolution of unity (1) is to be plotted, the algorithm would be required to test a grid of points consisting of 21 columns and 21 rows of $21^2=441$ points (21 rows and columns are used since both horizontal and vertical axes are included in the image). Because real numbers can be used an infinite number of points can exist within a bounded test region. Test regions can be infinitesimally small and infinitely complex. The resolution of the image would be limited only by the available technology (Gleick, 1987; Gulick, 1992).

We propose a model that might help describe these processes. The different solutions for the DOS and WINDOWS applications of identical complex waveforms are shown in Table 2. As seen in [1] a different function emerges when the computer utilized WINDOWS. From the latter formula the digital-to-analogue waveform was being phrase modulated or frequency modulated by the variable serial process that was time-shared by the WINDOWS environment represented here as a sine wave. Formula [2] indicated that the waveform can be modeled by a series of sine waves at any given time (the summed Fourier analysis of the entire signal). Since the

TABLE 2
THEORETICAL DESCRIPTION OF DOS VERSUS WINDOWS WAVEFORMS

DOS: $e = \mathrm{DAC}(t)$	[1]
WIN: $e = \mathrm{DAC}(t + \sin \omega t)$	
DOS: $e = \sin(\varpi_1 t) + \ldots + \sin(\varpi_n t)$	[2]
WIN: $e = \sin(\varpi_1 t + \sin \omega t) + \ldots + \sin(\varpi_n t + \sin \omega t)$	
DOS: $e = \sin[\varpi_1(t)t] + \ldots + \sin[\varpi_n(t)t]$	[3]
WIN: $e = \sin[\varpi_1(t)t + \sin \omega(t)t] + \ldots + \sin[\varpi_n(t)t + \sin \omega(t)t]$	

$\mathrm{DAC}(t)$ = Digital to Analogue Converter System Output at Time (t).
n = frequency component $(1 - \infty)$*
e = instantaneous voltage level applied to solenoids
t = time in seconds
ω = Windows variation radians/second $(2\Pi f_w)$
f_w = Windows variation frequency (hz)
$\varpi_1 \ldots \varpi_n$ = DAC frequency in radians/second $(\varpi_1 = 2\Pi f_1 \ldots \varpi_n = 2\Pi f_n)$
$f_1 \ldots f_n$ = DAC frequency component from Fourier analysis (Fig. 1)
$\varpi_1(t) \ldots \varpi_n(t)$ = DAC frequency rads/second $\varpi_n(t) = 2\Pi f_n(t)$ at time t
$f_1(t) \ldots f_n(t)$ = DAC frequency component Fourier analysis at time t
$\omega(t)$ = WINDOWS variation radians/second $= 2\Pi f_w(t)$ at time t
$f_w(t)$ = WINDOWS variation frequency (hz) at time t

*Note assuming an infinite sample rate for a theoretical Fourier analysis; n could have a maximum value equal to the Nyquist frequency which is one-half the sample rate or infinity.

equation for WINDOWS involves a sine of a sine, a theoretical bandwidth can be modeled by an infinite series of Bessell functions which implies that the bandwidth required for such a signal would be infinite (Kennedy, 1977). This concept is shown diagrammatically in Fig. 1.

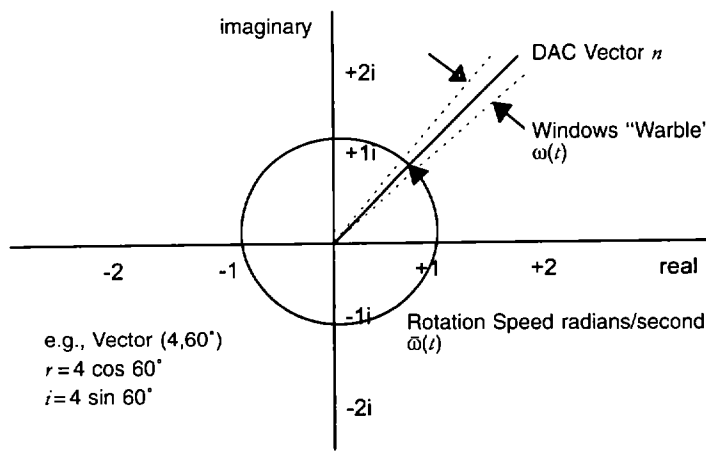

FIG. 1. Diagrammatic relation between real and imaginary space to describe the unique complex pattern of magnetic fields generated by the "same" signal from WINDOWS software

The equations indicated that WINDOWS software was not producing a simple "warble" in sine wave-time because the processing levels within the computer were constantly in flux. There would be much complexity emerging from the interaction between the operating system and the process operating within that process. Thus a second expansion of the model, [3], would indicate that each of the time varying functions is not fixed for the entire presentation and is different at any given time (the summed Fourier analysis of discrete increments of time).

If phase space can be viewed as an infinite entity and if the infinite bandwidth is a valid description, the analysis of WINDOWS-modulated waveforms can be extended into the realm of imaginary numbers. A time-varying signal can be represented on a two-dimensional grid that extends in the imaginary (i) space (vertical) and the real dimension (horizontal). A vector in this space would be represented by a positive or negative component in the imaginary dimension and a positive or negative component in the real dimension. If the vector was rotating about the center (0, 0i), then its location at any given time could be represented by a real and an imaginary pair of numbers, $r(t)$, $i(t)$ that would be represented by a function of time for each. A vector that is rotating at a fixed rate, for example, would be represented by a sine or cosine wave.

The next expansion of this model involves realizing that the actual voltage being applied at any given instant of time is the sum of the vectors rotating through two-dimensional space. The numbers of vectors existing in this space are unbounded, since a sum could be performed on an infinite series. An example of a very "crowded" phase space could be white noise. Thus, at any given time, there can be any number of vectors existing in this space representable by the rotating form depicted in Fig. 1.

We suggest that a physical dimension exists containing information that is correlated with the space-time characteristics of phenomena we perceive as objects and processes (Persinger, 1999). This information might be contained within the complexity of the temporal microstructure of phase-relationships and scalar components associated with the intrinsic magnetic fields associated with matter. This information could be immersed within much larger more slowly changing fields analogous to the complexity of sound waves evoked during linguistic communication whose intensities (milliPascal range) are millions of times smaller than the cruder and more simplistic changes associated with barometric pressure (kiloPascal range).

REFERENCES

BALL, P. (1999) *The self-made tapestry: pattern formation in nature*. New York: Oxford Univer. Press.

FRANK, J. (1991) *The correspondence of Michael Faraday*. Vol. 1. *1811 to 1831*. London: Institute of Electrical Engineers.

GARCIA-OJALVO, J., & ROY, R. (2001) Spatiotemporal communication with synchronized optical chaos. *Physical Review Letters*, 86, 5204-5207.

GLEICK, J. (1987) *Chaos: making a new science*. New York: Penguin.

GULICK, D. (1992) *Encounters with chaos*. New York: McGraw-Hill.

JAHN, R. G., & DUNNE, B. J. (1987) *Margins of reality: the role of consciousness in the physical world*. San Diego, CA: Harcourt Brace Jovanovich.

KENNEDY, G. (1977) *Electronic communication systems*. (2nd ed.) New York: McGraw-Hill.

KOREN, S. A., & PERSINGER, M. A. (1997) Analyses of the Aum Shinrikyo "brain stimulation device." (Unpublished Technical Report, 15 August, 1997)

NORRENTRANDERS, T. (1998) *The user illusion: cutting consciousness down to size*. New York: Penguin.

PERSINGER, M. A. (1999) On the nature of space-time in the perception of phenomena in science. *Perceptual and Motor Skills*, 88, 1210-1216.

PERSINGER, M. A., ROLL, W. G., TILLER, S. G., KOREN, S. A., & COOK, C. M. (2002) Remote viewing with the artist Ingo Swann: neuropsychological profile, electroencephalographic correlates, magnetic resonance imaging (MRI) and possible mechanisms. *Perceptual and Motor Skills*, 94, 927-949.

ROLL, W. G., PERSINGER, M. A., WEBSTER, D. L., TILLER, S. G., & COOK, C. M. (2002) Neurobehavioral and neurometabolic (SPECT) correlates of paranormal information: involvement of the right hemisphere and its sensitivity to weak complex magnetic fields. *International Journal of Neuroscience*, 112, 119-146.

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